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EXAMINER	
MASKELL, MICHAEL P	
ART UNIT	**PAPER NUMBER**
2809	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/531,236	GORBUNOV, BORIS ZACHAR	
	Examiner	Art Unit	
	Michael Maskell	2809	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *41-64* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *41,42,44,45,47-51,53-59,62 and 63* is/are rejected.

7)☒ Claim(s) *43,46,49,52,60,61 and 64* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *04/13/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 49 objected to because of the following informalities: the claim is directed towards a method according to claim 41 in which ions of pre-determined mobility are selected by means of an ion mobility selection unit and passed through the electric field to separate the charged particles from the uncharged particles. Viewing this claim in light of the rest of the disclosure, it is apparent that the "ions of pre-determined mobility" are actually a subset of the "charged particles" from claim 41. Since claim 41's language differentiates between the incoming ions and the outgoing larger ions by referring to the former as "ions" and the latter as "charged particles," claim 49 should read as follows to avoid ambiguity: "A method according to claim 41 in which charged particles of pre-determined mobility are selected by means of an ion mobility selection unit and passed through the electric field to separate the charged particles from the uncharged particles." Appropriate correction is required.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 50 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 50 refers to "said particles" from claim 41, but there are three groups of particles in claim 41: the group labeled "ions," which are the smaller

charged particles that initially enter the chamber, and the group labeled "charged particles," which are the larger charged particles formed from charge exchange between the "ions" and the "neutral particles" (these "neutral particles" representing the third group). "Said particles" in claim 50 could refer to any of the groups of particles in claim 41, rendering the claim indefinite. Correction is required.

3. Claims 58 and 59 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 58 and 59 refers to "the inlet" of the apparatus of claim 55 without specifying which of the two inlets claimed in claim 55 they are referring to, rendering the claims indefinite. Correction is required.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 55, 57, and 59 rejected under 35 U.S.C. 102(b) as being anticipated by Bassi, et al. ("Ion-molecule-reaction mass spectrometer for on-line gas analysis," J. Vac. Sci. Technol. A 16(1), Jan/Feb 1998).

Regarding claim 55, Bassi discloses an apparatus comprising a mixing chamber with a first inlet through which a gaseous sample comprising ions can enter, a second inlet through which uncharged particles entrained in a gas can enter, the mixing

chamber being operatively configured to facilitate collisions between the ions and the uncharged particles (said chamber depicted in Fig. 1 as the "scattering cell," also in Fig. 3 as the "reaction chamber" which receives ions from the primary ion source and uncharged particles through the sample gas inlet.), and an outlet from the mixing chamber so as to allow discharge of said particles into a separation chamber, which separation chamber comprises an electric field generating means and an outlet for discharging said separated particles into a charged particle detecting and numerical measuring means (said separation chamber being represented by the mass spectrometer in Fig. 1. A mass spectrometer functions by generating an electric field to separate particles and discharging them into a detector for numerical measuring. The separation chamber is also found in Fig. 3 as the "quadrupole mass spectrometer").

Regarding claim 57, Bassi discloses an apparatus according to claim 55, in which the electric field generating means comprises two spaced apart electrodes with an electric field generated between them (the quadrupole mass spectrometer of Fig. 3 comprises four such electrodes, thereby encompassing the two claimed electrodes and adding two more.)

Regarding claim 59, Bassi discloses an apparatus according to claim 55 wherein an ionization chamber comprising an ionization means for effecting ionization of molecules or clusters of interest is attached to the inlet of the mixing chamber (this is represented by the primary ion source).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 41, 42, 44, 49, 50, 53, 54 rejected under 35 U.S.C. 103(a) as being unpatentable over Eiceman ("Ion-mobility spectrometry as a fast monitor of chemical composition," Trends in Analytical Chemistry, vol. 21, no. 4, 2002 (in IDS)) in view of Zhang, et al ("Development of an electrostatic ion guide in chemical ionization mass spectrometry," Review of Scientific Instruments, Vol. 69, No. 11, 1998, pp. 4002-4003).

Regarding claim 41, Eiceman discloses a method of colliding ions with uncharged particles having greater mass than said ions and transferring a charge from said ions to the uncharged particles so as to produce charged particles (section 2.1, "Ion formation," equation 1, and table 1, which gives example analytes M. One of the analytes given is Dichloromethane, which has a higher mass than the reactant ion given in equation 1.); and numerically measuring the charged particles (Fig. 1, electrometer). Eiceman fails to teach subjecting the charged and uncharged particles in an electric field and separating the charged particles from the uncharged particles.

However, Zhang teaches a method of colliding ions with uncharged particles and transferring a charge from said ions to the uncharged particles so as to produce charged particles (p. 4003, paragraph 3); subjecting the charged and uncharged particles in an electric field and separating the charged particles from the uncharged

particles (p. 4003, paragraph 2); and numerically measuring the number of charged particles (Fig. 1, mass spectrometer). Zhang fails to teach the uncharged particles having a greater mass than the incoming ions; Zhang's example shows the opposite arrangement.

The teachings of Eiceman and Zhang are of analogous art; in fact, both teachings begin with the same method of producing charged particles and end with a counting of said charged particles; Zhang simply adds the crucial improvement of an ion guide that separates charged particles from uncharged particles. As Zhang teaches (p. 4003, paragraph 2), it is advantageous to remove the uncharged particles, as they contribute to unnecessary increases in pressure in the detector. It would therefore have been obvious to one of ordinary skill in the art to modify the teachings of Eiceman with those of Zhang to add Zhang's electrostatic ion guide to separate the charged particles from the uncharged particles. Doing so would allow higher pressures to be sampled without significantly raising the detector pressure.

Regarding claim 42, Zhang discloses the gaseous sample being a steady flow of a gas comprising ions, being combined and mixed with a steady flow of a gas comprising the uncharged particles (p. 4002, column 2, lines 5-8); the combined flow being subjected to the electric field (p. 4002, column 2, lines 13-20).

Regarding claim 44, Eiceman discloses the charged particles detected and counted individually by means of a single particle counting means (Fig. 1 depicts an ion arriving singly at the electrometer. Further, the electrometer is a faraday plate detector; these detectors generate a count for each charged particle that collides with them,

allowing the user to determine from the voltage how many particles arrive at the plate per unit time. Each individual colliding particle adds to the voltage signal, and so each particle is individually counted).

Regarding claim 49, Eiceman discloses ions of pre-determined mobility being selected by means of an ion mobility selection unit (Fig.1), while Zhang teaches passing the particles through an electric field to separate the charged particles from the uncharged particles (see rejection of claim 41 above).

Regarding claim 50, if "said particles" refers to the uncharged particles (see 112 rejection of claim 50 above regarding this ambiguity), both Zhang and Eiceman disclose these particles passing through an ionization chamber comprising ionization means (the mixing chamber where the uncharged particles collide with incoming ions, see rejection of claim 41 above) for effecting ionization of said particles, and Zhang teaches passing these particles through the electric field to separate the charged particles from the uncharged particles (see rejection of claim 41 above). If "said particles" refers to the incoming ions, it is obvious that these particles would have to have passed through an ionization chamber comprising ionization means in order to become ions (ionization is an inherent requirement for obtaining an ion). Zhang teaches the step of passing the particles through the electric field to separate the charged particles from the uncharged particles (again, see rejection of claim 41 above).

Regarding claim 53, the stated advantage of Zhang's ion guide is that it removes uncharged particles from the gas flow before introducing it into an analyzer. It is therefore suggested in the art to place said ion guide in the separation chamber,

leading into the differential mobility analyzer taught by Eiceman. It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to subject the charged and uncharged particles to an electric field to separate the charged particles from the uncharged particles in a separation chamber comprising a differential mobility analyzer.

Regarding claim 54, Eiceman discloses the charged particles impinging upon a detecting and numerical measuring means in a manner indicative of the magnitude of the respective charge (the electrometer of Fig. 1 measures the voltage created by the impinging of charged particles upon the plate. A doubly ionized particle adds twice the charge and thus twice the voltage change to the plate; therefore, the impinging is in a manner indicative of the magnitude of the respective charge.).

5. Claims 45, 47, 48 and 51 rejected under 35 U.S.C. 103(a) as being unpatentable over Eiceman in view of Zhang as applied to claim 41 above, and further in view of Sinha, et al (U.S. Patent 4,383,171).

Regarding claim 45, Eiceman in view of Zhang teaches the method according to claim 41, but fails to teach wherein the uncharged particles are formed as an aerosol.

However, Sinha teaches a method of analyzing particles of liquid or solid by forming them into an aerosol and introducing them into an apparatus for ionization and analysis (Column 2, lines 14-35). A person of ordinary skill in the art would realize that forming particles into an aerosol in this way could provide samples for many analysis methods, such as that of the instant invention. As Sinha teaches, this is valuable as it allows for analysis of environmental materials, such as air pollution. It would therefore

have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Eiceman in view of Zhang with those of Sinha to provide the method of claim 41, in which the uncharged particles are formed as an aerosol. Doing so would allow analysis of important environmental materials.

Regarding claim 47, the motivation taught by Sinha for providing particulate samples in the form of an aerosol is to study air pollution. While Sinha does not specifically use the term "hydrosol," one of the most common atmospheric materials to study is atmospheric water vapor. A hydrosol is a colloid with water as the dispersing medium. Air pollution is often found as particles entrained in water vapor droplets, together representing a colloidial mixture with water as the dispersing medium. Since this would be a common sample for the methods taught by Sinha, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the method according to claim 41 in which the uncharged particles are a liquid in the form of a hydrosol or emulsion.

Regarding claim 48, Sinha teaches numerical measuring of particles carried out by a light scattering detector (Column 3, lines 5-11). When measuring particles that consist of liquid particles, especially water, a contact method of numerical measurement such as the electrometer plate taught by Eiceman is not viable due to contamination effects. A non-contact means of measurement such as the light scattering detector taught by Sinha would be recognized by one of ordinary skill in the art as a preferable means of counting the particles. It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to modify Eiceman in view of Zhang

with the teachings of Sinha to provide the method of claim 41, in which the numerical measuring of the particles is carried out by a light scattering detector. Doing so would allow continuous measurement without the need to clean the detector.

Regarding claim 51, Sinha teaches a step of first evaporating a sample of said liquid or solid into a gas medium to be treated as a gaseous sample (claim 5). One of ordinary skill in the art would have recognized that gaseous samples are easier to manipulate in ion guides and mass spectrometers to separate out a trace sample after ionization; it would therefore have been obvious to one of ordinary skill in the art to modify Eiceman in view of Zhang with the teachings of Sinha to provide a method according to claim 41 for the detection of a trace species in a liquid or solid comprising a step of first evaporating a sample of said liquid or solid into a gas medium to be treated as a gaseous sample. Doing so would enable the analyzer apparatus to more easily separate out a trace sample.

6. Claims 56, 58, and 62 rejected under 35 U.S.C. 103(a) as being unpatentable over Bassi, et al in view of Eiceman.

Regarding claim 56, Bassi discloses the apparatus of claim 55, but fails to teach the numerical measuring means comprising a single particle counting means (in theory a mass spectrometer could detect single particles, but in practice sensitivity issues from the quadrupole effects make this impractical). Eiceman, however, teaches the use of an electrometer plate detector at the end of his drift tube (Fig. 1). If mass discrimination is not necessary for a particular application, one of ordinary skill in the art would find it obvious to simply remove the quadrupole and rely on a simple plate electrometer to

count the particles. It would therefore have been obvious to one of ordinary skill in the art to modify Bassi's teachings with those of Eiceman to replace the mass spectrometer with a simple plate electrometer, thus providing the apparatus of claim 55 comprising a single particle counting means. Doing so would provide greater sensitivity when quadrupole mass discrimination is not needed.

Regarding claim 58, Bassi discloses the apparatus according to claim 55, wherein certain ions are selected to enter the mixing chamber; however, Bassi specifically teaches using a 90-degree magnetic sector mass spectrometer to achieve this ("magnetic mass spectrometer" in Fig. 3, also described on page 118, paragraph 2.). As discussed above, however, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an ion mobility selection means to separate ions if the device were to be operated at a higher pressure. It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to use an ion mobility selection unit instead of a magnetic mass spectrometer to enable ions of pre-determined mobility to pass into the mixing chamber. Doing so would enable atmospheric pressure operation.

Regarding claim 62, Bassi discloses the apparatus of claim 55, but fails to teach where the separation chamber comprises a differential mobility analyzer. However, Eiceman teaches the use of a differential mobility analyzer to separate out charged particles of a specific mobility (Fig. 1). It would therefore have been obvious to one of ordinary skill in the art to modify the teachings of Bassi with those of Eiceman to add a differential mobility analyzer to the separation chamber. Doing so would allow an ion

mobility scan in addition to an ion mass scan by the mass spectrometer, which enables the user to separate isobars in the mass spectrum.

8. Claim 63 rejected under 35 U.S.C. 103(a) as being unpatentable over Bassi in view of Sinha. Bassi discloses the apparatus of claim 55, but fails to teach an evaporator to produce the molecules suspended in a gas medium. However, Sinha teaches the use of an evaporation means to vaporize a sample before introduction into an ionization and analysis means. It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to modify Bassi's teachings with the teachings of Sinha to provide the apparatus according to claim 55 wherein an evaporator is arranged to produce molecules suspended in a gas medium, and connected to the second inlet to the mixing chamber. Doing so would enable the analyzer apparatus to more easily separate out a trace sample.

Allowable Subject Matter

9. Claims 43, 46, 52, 60, 61, and 64 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Maskell whose telephone number is 571/274-3210. The examiner can normally be reached on Monday-Friday 8AM-5PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrell McKinnon can be reached on 571/272-4797. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael Maskell
07 June 2007

TERRELL L. MCKINNON
SUPERVISORY PATENT EXAMINER